

# MACNAB CYPRESS IN NORTHERN CALIFORNIA: A GEOGRAPHIC REVIEW

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Wolf's (1948) monograph on the American cypresses is an excellent taxonomic and geographic study. Recent activities of the State Cooperative Soil-Vegetation Survey, however, have uncovered some distributional data about cypresses that were not available to Wolf. Much of the information concerns the little-known northern groves of MacNab cypress, *Cupressus macnabiana* A. Murr., in Shasta and Tehama counties.

MacNab cypress was probably discovered in Shasta Co. in 1854. The exact locality of the type collection cannot be determined. Published material still does not adequately describe the distribution and ecology of this cypress which is scattered as small groves or as larger clusters of thickets around the Sacramento Valley (fig. 1, table 1). Ironically, the only well publicized and easily accessible stand of MacNab cypress in this region was destroyed recently by the construction of Whiskeytown reservoir.

In Lake Co. and adjacent areas of the Coast Range, MacNab cypress populations geographically overlap those of *C. sargentii* Jeps. Within these areas *C. sargentii* often dominates in lower canyon slopes and creek bottoms. Morphological "intermediates" between these two species have been observed by several collectors. Wolf (1948), however, discounted suggestions of introgression between *C. sargentii* and *C. macnabiana* in the Napa-Lake Co. area. Our observations support this suggestion.

MacNab cypress is geographically isolated from *C. bakeri* Jeps. in the Sierra Nevada-Cascade and Siskiyou Mountains. Jepson (1909; 1931) and Wolf (1948) have clearly outlined the morphological and ecological differences between these two species.

## REVIEW OF SHASTA-TEHAMA CYPRESS REPORTS

Since Sudworth (1908) included *C. bakeri* in *C. macnabiana*, we should first consider these *C. bakeri* reports. In northeastern Shasta Co., a large cypress stand occurs near Timbered Crater (Stone, 1965). Although discovered in 1898, it was apparently unknown to Sudworth. In 1909 Jepson described this Timbered Crater cypress as *C. bakeri*.

Sudworth (1908) specifically mentioned seven *C. macnabiana* localities in Shasta and Tehama counties. Wolf transferred one of these seven to *C. bakeri*. Sudworth's "west of Burney Creek" grove is the western outpost of the large Burney Springs *C. bakeri* population. Another locality vaguely cited by Sudworth as "small grove at base of Lassen buttes" was probably based on another ambiguous report of the same Burney Springs population. Sudworth also mentioned a cypress locality at "South Fork of Cow Creek," nine miles southwest of the Burney

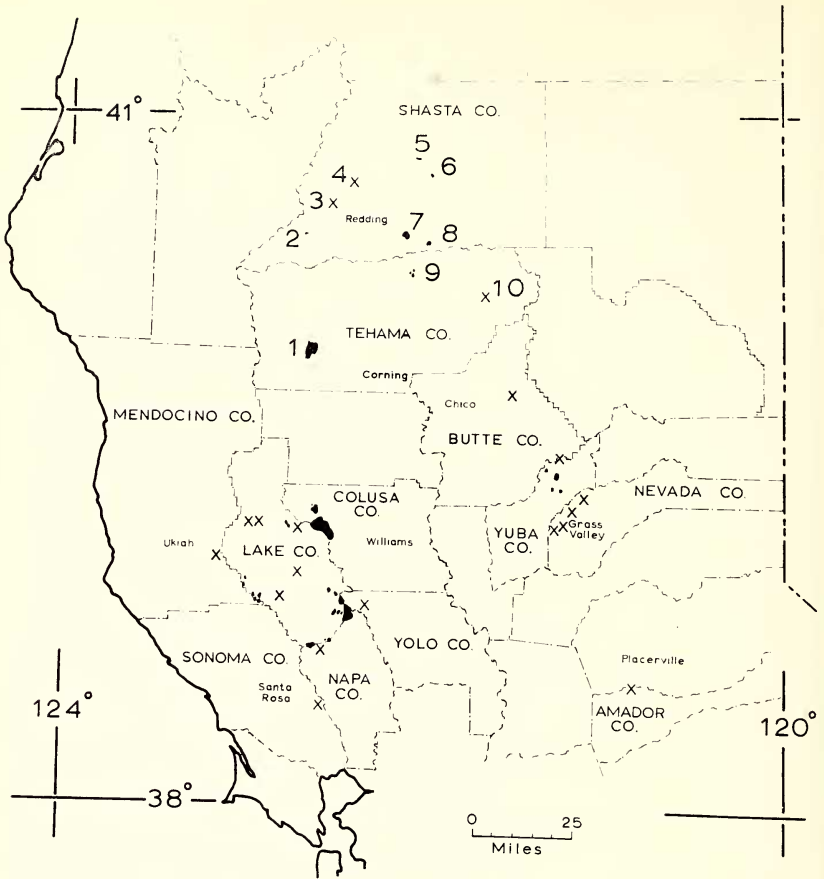


FIG. 1. Diagrammatic map of *Cupressus macnabiana* distribution in northern California. Shaded areas represent stands mapped by the State Cooperative Soil-Vegetation Survey. Crosses indicate unmapped stands listed in Tables 1 or 2. Numbered stands are described in Tables 2 and 3.

Creek grove. Through the efforts of E. L. Little, Jr. we examined many unpublished notes and maps and found that Sudworth's report was based on a letter dated Jan. 19, 1907, from J. C. La Plant. The letter mentioned two thrifty trees in the area. We checked this region but found no cypress. The trees that were there were most likely the montane *C. bakeri* and not the foothill *C. macnabiana*.

Wolf became skeptical of Sudworth's notes after he found *Juniperus californica* Carr. at the "Butte Creek" (Battle Creek) locality. There is no cypress now in the section cited (table 2). Sudworth had established the locality from another report forwarded by La Plant on Feb. 13, 1907. La Plant's report may have been prompted by a rumor about the Ash Creek cypress grove three miles north of the juniper locality.

TABLE 1. GENERAL LOCALITY AND ASSOCIATED SOIL PARENT MATERIAL OF MACNAB CYPRESS POPULATIONS. SHASTA AND TEHAMA CO. STANDS ARE DESCRIBED IN TABLES 2 AND 3

Locality	Dominant Soil Parent Material <sup>1</sup>	Remarks
AMADOR CO.		
E of River Pines	Ultrabasics (serpentinite)	In T. 8 N. not T. 9 N. as listed by Wolf, 1948.
NEVADA CO.		
NE of Grass Valley	Ultrabasics (serpentinite)	
SW of Grass Valley	Metavolcanics (greenstone with serpentinite veins and basic intrusives (gabbro))	Hall 10182 UC) and Wieslander, 1928.
NE of Nevada City	Probably basic intrusives or ultrabasics	Burk 10 (UC)
YUBA CO.		
All mapped stands	Basic intrusives (gabbro)	Not "granitic" as listed in Wolf, 1948.
E of Forbestown	Ultrabasics (serpentinite)	Sias (UC)
BUTTE CO.		
Magalia	Ultrabasics (serpentinite)	
SONOMA CO.		
Hooker Canyon	Pliocene pyroclastics (tuff)	Small groves 4 miles N. and 2 miles SE of main grove reported in 1905.
NAPA, LAKE, COLUSA, MENDOCINO CO.S		
All major populations mapped by SV Survey and most small unmapped stands.	Ultrabasics (serpentinite)	
High Valley Ridge	Metasediments	{ Zinke 196 (UC) Example of minor nonserpentine grove in Lake Co.
YOLO CO.		
Cedar Basin	Sandstone	

<sup>1</sup> Calif. Div. Mines. Chico sheet (1962), Santa Rosa sheet (1963), Ukiah sheet (1960), Geologic map of California, San Francisco. All rocks were mapped as Mesozoic in age except for Sonoma Co. tuff.

Another area of confusion in Sudworth's published list is near Paynes Creek, Tehama Co. The "Payne Creek" report was probably based on the same trees as the "Inskip" report.

Kildale's "Trinity River" collection (table 2) is confusing because no other Trinity Co. cypress report has come to our attention. Sargent's (1922) mention of "Trinity County between Shasta and Whiskeytown" obviously referred to the Shasta Co., Whiskeytown grove. Kildale's specimen label stated that it was collected on the "Trinity River, at Betty May Mine." Unfortunately, no Betty May mine has ever been recorded in the legal files of Trinity Co. A mine with a similar name did exist in the Clear Creek mining district near Whiskeytown.

TABLE 2. SUMMARY OF MACNAB CYPRESS STANDS REPORTED IN SHASTA AND TEHAMA COUNTIES

General Area	Specific Locality	Status in Wolf (1948)	Remarks
"Butte Creek"	"Sec. 25, T. 30 N., R. 1 W." (Sudworth, 1908)	Discredited.	<i>Juniperus californica</i> present at this locality.
Paynes Creek	"Near Payne post office and on Payne Creek Hill. . . ." (Sudworth, 1908)	Discredited.	Same as Inskip Butte stand.
Trinity River	". . . at Betty May Mine, Trinity County." <i>Kildale 10276</i> (DS)	This one 1930 collection mentioned.	Probably a Whiskeytown collection.
Raglin Ridge (1)	Sec. 20, 21, 22, 27, 28, 29, T. 25 N., R. 7 W.	Not known to Wolf	Shown on S-V map 31 D-3, 42 A-2. Portions on public lands.
Rainbow Lake (2)	SW-¼, Sec. 31, T. 31 N., R. 7 W.	Not known to Wolf	Shown on S-V map 31 A-2. Private land.
Whiskeytown (3)	Sec. 16, 21, T. 32 N., R. 6 W.	Described in detail.	Entire stand destroyed by construction of Whiskeytown Lake.
Kennett (4)	"Along road off U.S. 99, leading to Kennett . . ." <i>Bacigalupi 2386</i> (DS)	This one 1934 collection mentioned.	These trees can no longer be found.
Montgomery Creek (5)	Sec. 35, T. 35 N., R. 1 W. R. 1 W.	Not known to Wolf.	Shown on S-V map 22 B-3. Private land.
Round Mountain (6)	Sec. 26, T. 34 N., R. 1 W.	Not known to Wolf.	Shown on S-V map 22 B-3. Private land.
Lack Creek (7)	Sec. 36, T. 31 N., R. 2 W. Sec. 31, T. 31 N., R. 1 W.	Not known to Wolf.	Shown on S-V map 32 A-1. Private land.
Ash Creek (8)	Sec. 11, 12, T. 30 N., R. 1 W.	Not known to Wolf.	Shown on S-V map 33 B-2. Portions on public lands.
Inskip Butte (9)	"T. 29 N., R. 1 W." (Sudworth, 1908)	Discredited.	Shown on S-V map 33 B-3. In Sec. 22, 23, 27. Private land.
Mill Creek Rim (10)	"Sec. 5, T. 27 N., R. 3 E."	Mentioned by Jepson (1931), not discussed by Wolf.	This stand has not been relocated.

We probably have not located the exact point of the Kennett collection (table 2). Owing to the many road relocations and widespread habitat disturbance since Shasta Dam was built, it is not surprising that these trees cannot be found. Some cypress might still survive in the brush above Shasta Lake, but no significant population exists in the area today.

The six previously unreported cypress stands, in Shasta and Tehama counties (table 2), have probably been known to a variety of non-botanists for a long time. But no published references to these groves or herbarium specimens from them before the Soil-Vegetation Survey have come to our attention. Sudworth had limited information about at least one of these groves. C. Hart Merriam mentioned MacNab cypress near Round Mountain in a 1908 note.

Population samples from all localities (except Whiskeytown) listed in Table 3 are available at the Pacific Southwest Forest and Range Experiment Station, Redding.

#### GROVE DESCRIPTIONS

The Shasta-Tehama cypress groves have physiographic and broad climatic similarities. All are above the valley terraces (table 3). Summers are dry and hot, and the abundant fuel creates extreme fire hazards in all of them. Vegetationally, the groves are part of a complex mosaic of chaparral and woodland communities. They grow above the oak savannas and just within the lower fringes of the coniferous forest. Three widely distributed shrubs—*Arctostaphylos viscida* Parry, *Ceanothus cuneatus* (Hook.) Nutt., and *Eriodictyon californicum* (H. & A.) Torr.—are associated with all the groves. *Pinus sabiniana* Dougl. grows in, or adjacent to, all the groves. *Salvia sonomensis* Greene carpets the ground around many of the groves. Yet, these MacNab cypress habitats reveal considerable diversity.

Climate. While emphasizing the dry nature of *C. macnabiana* habitats, Wolf (1948) underestimated their mean annual precipitation. He generalized that most localities had about 20 inches of rainfall, noting Whiskeytown as an exception with 35 inches. Current data raise this Whiskeytown estimate nearer to 50 inches (table 3). The Montgomery Creek grove is the wettest in the Shasta-Tehama area, with 60 inches or more. Other groves to the south in the Sierra Nevada also receive heavy precipitation. The Inskip locality has half as much rainfall as the wetter areas, and it may be as dry as any of the Coast Range localities.

No long-term temperature data are available for any of these localities. Although their heat regimes appear superficially similar, aspect and elevational differences are great enough so that some temperature variation should be present. Edaphic factors appear more helpful in explaining the distribution of these disjunct populations than climatic patterns.

Soils and Vegetation. Although many of the Sierra Nevada and Coast Range populations are associated with ultrabasic rocks (table 1),

TABLE 3. GEOGRAPHIC COMPARISON OF SHASTA AND TEHAMA COUNTY  
 MACNAB CYPRESS POPULATIONS

Population Locality	Size	Elevational Range	Mean Annual Precipitation <sup>1</sup>	Soil Parent Material <sup>2</sup>	Soil (B Horizon) Characteristics
	acres	feet	inches		
Raglin Ridge (1)	1,500	2300-3200	45-50	Mesozoic ultrabasics (serpentinized)	Shallow, rocky, clay loam, neutral.
Rainbow Lake (2)	22	1700-1900	45-50	Mesozoic ultrabasics (serpentinized)	Shallow, rocky, clay loam, neutral.
Whiskey-town (3)	300	1000-1200	45-50	Devonian Meta-rhyolite	Shallow, clay loam, strongly acid.
Montgomery Creek (5)	75	1800-2200	60-65	Eocene non-marine sediments	Moderately deep, rocky, clay, strongly acid.
Round Mountain (6)	23	2500-2600	55-60	Eocene non-marine sediments	Moderately deep, rocky, clay, strongly acid.
Lack Creek (7)	350	1400-1550	30-35	Pleistocene basalt	Moderately deep, rocky, clay, strongly acid.
Ash Creek (8)	200	2800-2900	30-35	Pleistocene basalt	Moderately deep, very rocky, silty clay, moderately acid.
Inskip Butte (9)	100	1850-2250	25-30	Recent basalt	Extremely rocky, silt loam.

<sup>1</sup> Calif. Dept. Water Resources. Shasta County Investigation Bulletin 22, Sacramento. 1964.

<sup>2</sup> Calif. Div. Mines. Redding sheet (1962), Westwood sheet (1960), Geologic map of California. San Francisco.

only two of these populations grow on serpentinite (table 3). The widely scattered thickets on Raglin Ridge are on part of an extensive ultrabasic tract resembling the Lake Co. cypress areas. The little Rainbow Lake grove is within a smaller, perhaps less serpentinized ultrabasic mass 30 miles to the north of Raglin Ridge.

The chaparral associated with these two groves has a similar aspect, for the serpentine endemic scrub oak, *Quercus durata* Jeps., is abundant in both. Shrubs of *Rhamnus californica* ssp. *crassifolia* (Jeps.) Wolf occur in both. The Raglin Ridge cypress area appears to have a richer shrub flora, including *Ceanothus jepsonii* Greene and *Garrya congdonii* Eastw. The higher elevation cypress groves on Raglin Ridge are interspersed with dense *Pinus attenuata* Lemm. thickets.

The edaphic situation at Whiskeytown was unique in relation to all other MacNab cypress localities. The cypress was concentrated on a bench of meta-rhyolite. Portions of the area had fine textured, mottled

soil horizons that restricted deep rooting. Wolf described the area as having "sterile nearly white rocky soil." McMillan (1956) characterized it as "fine whitish alluvium" from granite. He sampled soils at six different cypress localities, and Whiskeytown had the lowest pH (4.98). The chaparral in the basin was relatively poor in species. The cypress here was also mixed with *Pinus attenuata* thickets.

The Round Mountain and Montgomery Creek groves are only five miles apart. Both are on part of an extensive formation of loosely consolidated sandstone and gravel. These soils are mostly covered with woodland at all elevations.

The Lack Creek and Ash Creek groves are also about five miles apart. Both are on reddish soils derived from basalt. Although deep in spots, these soils are liberally mixed with large boulders. Such zonal woodland soils occur on tens of thousands of acres of volcanic flows to the east of the Sacramento Valley. The chaparral around these two populations has a great diversity of species present. Both have dense clumps of shrubby *Quercus garryana* Dougl. The Lack Creek community includes such species as *Fraxinus dipetala* H. & A., *Fremontodendron californicum* (Todd.) Cov., and *Ptelea crenulata* Greene which are not present at the other Shasta-Tehama cypress localities. A disjunct *Adenostoma fasciculatum* H. & A. population (*Wislander 338*, UC) also occurs at Lack Creek. Although it is the dominant shrub on millions of acres in the hills west of the Sacramento Valley, *Adenostoma* is rare in the volcanic region to the east of the Valley.

Inskip Butte contrasts with all the other *C. macnabiana* localities. The "soil" on this small, recently formed volcano consists of silty material in the fractures of the porous basalt. Annual grassland and oak savanna grow on older volcanic materials which surround the butte. Northeast slopes of the butte support a poor pine forest, while the cypresses occur on the lower west slopes in depauperate chaparral communities. Associated with the cypresses on Inskip Butte are thickets of a disjunct *Pinus attenuata* population.

Intensive study of aerial photographs and limited field work have proved insufficient to relocate the Mill Creek stand. There is no reason to doubt that the specimen sent to Jepson (1931) was *C. macnabiana* and that it came from the vicinity of the Mill Creek Canyon in Tehama Co. A small grove may still be there.

#### DISCUSSION

The relatively little-known stands discussed here do not significantly extend the total distribution of *C. macnabiana*. The rejection of the Trinity River locality even restricts the northwestern corner of the range. But these data do supplement our knowledge of how this species is scattered about the Sacramento Valley. The Whiskeytown stand was most inadequate to illustrate the range of edaphic and climatic conditions that this cypress can tolerate in its northern distribution.

The Raglin Ridge and Rainbow Lake stands appear to be a northern extension of the common Coast Range distribution pattern. More intensive study of the ultrabasic zone across Glenn Co. may yet reveal some small MacNab cypress groves in the gap between the Colusa and Tehama County populations (fig. 1). One difference in these two northern Coast Range MacNab cypress communities is the absence of any other cypress species. In the Lake Co. and adjacent serpentinite areas, *C. sargentii* grows in or near many *C. macnabiana* stands.

The eastern Shasta-Tehama stands may be viewed as an extension of the Yuba and Butte Co. populations. Again, closer study of the most inaccessible brushy canyons might reveal a few isolated trees or small groves that have escaped botanical notice. In contrast to the Coast Range situation, no edaphic trend is apparent along this Sierra Nevada-Cascade distribution.

From the standpoint of base exchange properties, there might be some similarities between the basic extrusive, basic intrusive, and ultrabasic soils represented here. The Kennett grove which must have been on greenstone also fits into this pattern. Even the Montgomery Creek and Round Mountain sediments were derived largely from basic igneous materials. But if there are any soil chemical similarities, they seem to be obscured by the gross differences in physical properties. The contrast between the reddish clay loam over clay at Lack Creek, which may be more than five feet deep, with the greyish silty loam at Inskip, which may be only a few inches deep, is startling.

Gankin and Major (1964) discussed the distributional patterns of many disjunct and endemic species. They noted that disjunct species frequently exploited non-zonal sites "where competition is decreased by some kind of extraordinary soil parent material or other continuously effective disturbance of climax vegetation development." Most of these MacNab cypress groves fit conveniently into the context of their discussion. The Inskip Butte grove is a good example. The zonal vegetation appears to be excluded from the recent volcanics because of insufficient soil development. In the absence of savanna-woodland species, the cypress can survive on the lava.

Perhaps of greater interest are the Lack Creek and Ash Creek populations, that seem to depart from this general pattern. They grow on widely distributed geologic materials with normal degrees of soil development for this area. Although these cypresses compete with zonal chaparral species on zonal soils, they seem to be in no imminent danger of losing out. Edaphic factors are not obviously involved with the particular location of these cypress groves. Other environmental factors that may contribute to the competitive advantage of cypress in these localities are not apparent. Since it is difficult to explain the presence of the cypresses ecologically, they must grow on these zonal soils because of historical reasons. The coincidental presence of the isolated *Adenostoma*



colony at Lack Creek suggests that some peculiar set of circumstances has influenced this vegetation in the past.

Three of the Shasta-Tehama cypress groves are closely associated with *Pinus attenuata* populations. Two other groves are not far from *P. attenuata* areas. Several ecological similarities between these two different fire-adapted conifers are apparent. The historical events that have contributed to the widely scattered distribution of *P. attenuata* probably have also influenced the distribution of MacNab cypress. The pine, however, has a broader range of ecological tolerances. Its range closely approximates the combined range of the three cypresses mentioned here: *C. macnabiana*, *C. sargentii*, and *C. bakeri*.

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## A NEW SPECIES OF PRIMROSE FROM NEVADA

NOEL H. HOLMGREN

*Primula nevadensis* N. Holmgren, sp. nov. Folia erecta, scapos plerumque superantes, oblanceolata vel lineari-oblanceolata, (2.5)-5-10-(12) cm longa, 0.6-1-(1.5) cm lata, distaliter grosse dentata vel enterdum subtiliter dentata vel etiam integra, ad apicem obtusa vel